PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

Annual Review of Base Rates for Fuel Costs for Duke Energy Progress, LLC	} } } } }	**Docket No. 2018-1-E**

Direct Testimony of Devi Glick

On Behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy

On the Topic of Annual Review of Base Rates for Fuel Costs for Duke Energy Progress, LLC

May 22, 2018

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1. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name and business address for the record.

A. My name is Devi Glick. I work at Synapse Energy Economics, Inc., located at 485 Massachusetts Avenue in Cambridge, Massachusetts.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics is a research and consulting firm specializing in electricity and natural gas industry regulation, planning, and analysis. Our work covers a range of issues, including integrated resource planning; economic and technical assessments of energy resources; electricity market modeling and assessment; energy efficiency policies and programs; renewable resource technologies and policies; and climate change strategies. Synapse works for a wide range of clients, including attorneys general, offices of consumer advocates, public utility commissions, environmental advocates, the U.S. Environmental Protection Agency, the U.S. Department of Energy, the U.S. Department of Justice, the Federal Trade Commission, and the National Association of Regulatory Utility Commissioners. Synapse has over 20 professional staff with extensive experience in the electricity industry.

Q. Please summarize your professional and educational experience.

A. I have a master's degree in public policy and a master's degree in environmental science from the University of Michigan; a bachelor's degree in environmental studies from Middlebury College; and more than five years of professional experience as a consultant, researcher, and analyst.

At Synapse and previously at Rocky Mountain Institute, I have focused on a wide range of energy and electricity issues, including: utility resource planning, distributed energy resource valuation, energy efficiency program impact analysis, and rate design effectiveness. For this work, I develop in-house models and perform analysis using industry-standard models.

On topics related to the costs and benefits of distributed generation, I have co-authored two studies reviewing valuation methodologies for solar photovoltaics (PV). These studies have been highly cited in public utility proceedings for their recommendations around distributed energy resource pricing and rate design. Most recently, I evaluated various rate design options for distributed energy resources within the state of Hawaii.

My CV is attached as Exhibit DG-1.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of the South Carolina Coastal Conservation League (CCL) and Southern Alliance for Clean Energy (SACE).

Q. Have you testified previously before the South Carolina Public Service Commission ("the Commission")?

A. Yes. I testified on behalf of CCL and SACE in South Carolina Electric & Gas Company's most recent annual fuel cost proceeding, Commission Docket Number 2018-2-E.

Q. What is the purpose of your direct testimony in this proceeding?

A. The purpose of my testimony is to provide input on the 2018 application of the Net Energy Metering (NEM) Methodology for valuing distributed energy resources (DERs) on Duke Energy Progress, LLC's (DEP or the Company) system within South Carolina. DEP includes zero values for most of the NEM Methodology calculations for 2018. My testimony is narrowly focused on providing input on how to proceed with filling in several of these components within the NEM Methodology. Note that the fact that I have not addressed each of the zero value components does not mean that I agree that zero is the appropriate value.

Q. How is the remainder of your testimony organized?

A. My testimony is organized as follows:

1. Introduction and Qualifications
2. Summary of Conclusions and Recommendations
3. Background on the NEM and Fuel Cost Calculations
4. Net Energy Metering Methodology – 2018 Application

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

- DG-1: Resume of Devi Glick,
- DG-2: Report from the Rocky Mountain Institute: *A Review of Solar PV Benefit and Cost Studies*,
- DG-3: The Mendota Group, LLC. *Benchmarking Transmission and Distribution Costs Avoided by Energy Efficiency Investments, for Public Service Company of Colorado*, and
- DG-4: Avoided Transmission Capacity Calculation.

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your primary conclusions.

A. My primary conclusions, discussed and supported in greater detail below, are summarized as follows:

1. It is possible to quantify avoided transmission costs and those avoided costs are non-zero, therefore DEP should no longer be permitted to use a placeholder value of zero in the transmission and distribution (T&D) capacity category.
2. It is possible to quantify the avoided environmental cost of coal ash disposal as it relates to distributed PV, therefore DEP should no longer be

permitted to use a placeholder value of zero in the Environmental Costs category.

3. An updated line losses study that calculates the distributed PV output-weighted marginal line loss based on the current footprint of DEP would improve application of the NEM methodology.

Q. Please summarize your primary recommendations.

1. The Commission should require DEP to immediately adopt an avoided T&D Capacity value of $0.005778/kWh based on the Current Values approach described below.

2. DEP should conduct a study to more specifically quantify the avoided environmental cost of coal ash disposal as it relates to distributed PV to inform future NEM valuation updates in the fuel cost proceedings.

3. DEP should perform an updated line losses study to quantify marginal line losses associated with avoided energy, generating capacity and transmission capacity costs across DEP's current footprint. This study should be based on the Company's forecasted load and generation, and it should use a solar PV profile (not a fixed constant output profile).

3. BACKGROUND ON THE NEM AND FUEL COST CALCULATIONS

Q. Did DEP correctly calculate the value for each component of NEM distributed energy resource?

A. No, DEP did not. DEP assigned a value of zero to seven of the eleven components of NEM without presenting a detailed analysis of several components, including transmission and distribution cost deferral and avoided environmental costs.

Q. Is DEP required to calculate a value for each NEM component or can it continue to use a value of zero as a placeholder?

A. DEP must calculate values for several components that it has previously valued at zero. In the 2014 Settlement Agreement to Docket No. 2014-246-E, the parties agreed that:

> "The Methodology includes all categories of potential costs of benefits to the Utility system that are capable of quantification or possible quantification in the future. Where there is currently a lack of capability to accurately quantify a particular category and/or a lack of cost of benefit to the Utility system the category has been included in the Methodology as a placeholder … **Placeholder categories will be updated and included in the calculation of costs and benefits of net metering if and when capabilities to reasonably quantify those values and quantifiable costs or benefits to the Utility system in such categories become available."**

There exists currently the capability to quantify the value of Transmission and Distribution Capacity deferral, and avoided environmental costs, therefore DEP is required to calculate these costs and include them in the value of NEM.

4. NET ENERGY METERING METHODOLOGY – 2018 APPLICATION

Transmission and Distribution Capacity Costs

Q. How has DEP presented the value associated with avoided Transmission and Distribution Capacity Costs?

A. DEP included the value as $0.00000 (Witness Brown Testimony, page 8, table 4) for avoided transmission and distribution (T&D) capacity, for both Small and Large PV.

Q. Is a zero value appropriate for the avoided Transmission and Distribution Capacity cost component?

A. No. A value of zero was initially used as a placeholder because a detailed transmission and distribution avoided cost study could not be completed quickly

enough for inclusion in the first docket. It is not clear from DEP testimony that the Company has attempted to calculate or quantify this component. It is now possible to reasonably quantify the avoided transmission and distribution capacity costs, therefore there is no longer adequate justification to use a placeholder value.

Q. Have other utilities adopted a non-zero value for avoided Transmission and Distribution Capacity cost component?

Yes. In 2013 I reviewed 15 studies for Rocky Mountain Institute's "A Review of Solar PV Benefits & Costs Studies, 2nd Edition."[1] This study was included in the set of materials provided at "The World after Act 236" Continuing Legal Education Conference presented by The Electric Cooperatives of South Carolina and South Carolina Coastal Conservation League, August 25-26, 2014 at Wild Dunes Resort, Isle of Palms, SC. A copy of this study is attached as Exhibit DG-2.

Twelve of the reviewed studies included a Transmission and Distribution benefit within the avoided cost categories. All 12 included a non-zero avoided cost for the Transmission and Distribution benefit. For example, Crossborder Energy found an avoided Transmission and Distribution capacity value of around $0.025/kWh for Arizona Public Service and $0.015/kWh for California. Since that time, many more value of solar studies have been conducted and had a non-zero value for avoided transmission or distribution capacity.

Q. What approaches have other utilities taken to calculate the value of avoided transmission and distribution capacity costs?

A. Utilities have taken several different approaches to valuing avoided transmission and avoided distribution costs. Below is a sample of methodologies that utilities

[1] Hansen, L, Lacy, V, and Glick, D. 2013. *A Review of Solar PV Benefit and Cost Studies.* Rocky Mountain Institute. Available at https://rmi.org/wp-content/uploads/2017/05/RMI_Document_Repository_Public-Reprts_eLab-DER-Benefit-Cost-Deck_2nd_Edition131015.pdf

have used to quantify the value of avoided transmission or avoided distribution costs:

Maine's Value of Solar study, Clean Power Research (CPR)

For this study, CPR used historical transmission tariffs as a proxy for the cost of future transmission that is avoidable or deferrable through the use of distributed generation (DG). Maine is part of ISO-New England, and pays a transmission tariff (ISO-NE Open Access Transmission Tariff (OATT)) on a per-KW demand charge that is a function of monthly system peak for transmission service. "Avoided costs are estimated by determining the savings to the distribution utility that would result from a reduction of monthly peak demands and the resulting reduction in network load allocation."[2]

MidAmerican Energy Company, Demand Side Management Filings

MidAmerican took a simplified Current Values approach. It calculated the average cost to serve existing load by dividing both the transmission and distribution system net cost by the systems peak capability. MidAmerican used publicly available FERC Form 1 data on original cost of plant less accumulated depreciation, load data and generation capability data to estimate the $/kW cost for each system.[3]

PacifiCorp IRPs

PacifiCorp used a cost of service study to estimate the value of avoided transmission and distribution credits for its Integrated Resource Plan (IRP) in Oregon, Washington, Idaho, California, Wyoming, and Utah. PacifiCorp estimated the demand-related substation costs by looking at substation capacity investment for the next five years, dividing that investment by total increased capacity in kVA, and annualizing the result. PacifiCorp did the same for

[2] Clean Power Research, *Maine Public Utilities Commission, Distributed Solar Valuation Study*. April, 2015.

[3] "Direct Testimony of Jennifer L. Long," Application for Approval of Energy Efficiency Plan for 2014-2018 (Docket EEP-2012-0002), Submitted to Iowa Public Utilities Board by MidAmerican Energy Company, Feb. 1, 2013, p. 4. Note that MidAmerican modified its approach to incorporate on peak load data instead of generation capability data.

transmission costs, dividing total growth-related transmission investment over the next five years by forecasted change in peak, and annualizing the result.[4]

Q. What approaches should DEP consider? Please explain each in detail, including the advantages and disadvantages of each.

A. There are several potential approaches that DEP can take. It is important to note that even though avoided T&D capacity is expressed as a single component, it is composed of two distinct components, transmission capacity and distribution capacity, and these can be evaluated and calculated separately.

System Planning Study

DEP could do a systems planning study that takes an in-depth forward-look at the utility's forecasted load, transmission and distribution plans.[5] For both the transmission and distribution systems, the utility would model the respective system (distribution or transmission) with and without incremental blocks of distributed solar PV (or alternatively with decreased load). DEP could then compare the present value of the original transmission and distribution investment plan and the deferred or avoided transmission and distribution investments. This approach is the most accurate, but also the most time intensive and costly to conduct. It also requires full information on the company's transmission and distribution systems, generators and load, as well as modeling software that is capable of representing system operation and capacity expansion.

Review of Historical Transmission and Distribution Spending

Absent a full system plan, DEP can review prior transmission and distribution spending and identify which projects were deferrable due to solar PV.[6] A retrospective review of prior spending requires access to, and knowledge of all

[4] The Mendota Group, LLC. *Benchmarking Transmission and Distribution Costs Avoided by Energy Efficiency Investments, for Public Service Company of Colorado*. October, 2014, pages 8-9.

[5] The Mendota Group, LLC. *Benchmarking Transmission and Distribution Costs Avoided by Energy Efficiency Investments, for Public Service Company of Colorado*. October, 2014, page 6.

[6] The Mendota Group, LLC. *Benchmarking Transmission and Distribution Costs Avoided by Energy Efficiency Investments, for Public Service Company of Colorado*. October, 2014, page 8.

projects and spending on either the transmission or distribution system over a period of years sufficient to display normal investment. Investments would be broken down into two categories: upgrades required due to load growth, and upgrades not related to load growth. Upgrades required to meet load growth could be considered avoidable. This approach is less accurate than a full in-depth model and still requires full access to the Company's T&D plans and a technical understanding of which types of projects are driven by load growth and which are not.

Statistical Correlation of Transmission and Distribution Capital Investment and Forecasted Load Growth

DEP can estimate the avoided cost of T&D based on statistical analysis of the correlation between transmission and distribution spending and forecasted load growth. This approach evaluates how much transmission or distribution spending can be deferred or avoided by solar PV, and how much spending is independent of load growth and is not impacted by solar PV. This methodology is less accurate than the in-depth study and the retrospective review, but only requires utility data on T&D investment broken down by the year in which projects came online. Estimates can be performed with publicly available forecasts on load growth and FERC Form 1 data on transmission spending when detailed utility data is not provided.

Current Values Approach

The Current Values approach uses publicly available data on T&D system investments to calculate an average avoided cost. Specifically, FERC Form 1 data on original cost of plant less accumulated depreciation is divided by peak system capability to provide the $/kW cost for each system.

Q. Have you calculated a value for avoided T&D on DEP's system? If yes, which approach did you use?

A. Yes, I have. I used the Current Values approach to estimate which transmission and distribution spending was correlated with load growth and could be deferred

or avoided through distributed PV. Despite multiple discovery requests, access to more detailed T&D spending reports or information was not provided in time for this testimony deadline, and therefore I was not able to conduct more in-depth analysis on transmission and distribution spending.[7]

Q. How would you recommend the Commission proceed with respect to determining a company- and state-specific avoided T&D component value?

A. If DEP's system is summer peaking, the avoided transmission capacity value is $0.050851/kWh (Exhibit DG-4, Row 10). If, on the other hand, DEP's system is dual peaking, the avoided transmission capacity value is the smaller of the two seasonal values, $0.005778/kWh (Exhibit DG-4, Row 11). Because DEP currently purports to be dual peaking, I recommend that the Commission immediately adopt the duel peaking value of $0.005778/kWh. As DEP focuses on deploying cost-effective winter-time DSM, it is reasonable to expect that the system will return to summer peaking. At that time, a summer-only value for avoided T&D should be used.

Q. How did you arrive at your recommended avoided T&D component value?

A. I arrived at the $0.005778/kWh value for avoided T&D capacity by using the Current Values approach using publicly available FERC Form 1 data (Exhibit DG-4). The Current Values approach calculates the current value of the transmission system per kW of transmission peak use. This value represents the cost of serving an additional kW, or conversely the savings from avoiding additional transmission need.

When using this method to calculate avoided transmission capacity associated with solar PV, it is important to weigh the avoided transmission capacity value by solar PV's system capacity credit. To represent the avoided transmission capacity value on a $/kWh basis, the avoided cost must be divided by the expected energy

[7] At the time of this filing, the Company has provided distribution data for just the past three years and with transmission data for a longer period (since 2000), but for only some transmission projects (new line and reconductor projects).

production of the incremental solar PV. These steps have been incorporated into my calculation.

Environmental Costs

Q. How has DEP presented the 2018 value associated with avoided Environmental Costs?

A. DEP represented the value as $0.0000 (Witness Brown, Page 8, Table 4).

Q. Please comment on DEP's use of a zero value for the Environmental Costs Component.

A. As with the avoided T&D Capacity component, a value of zero was used under the 2014 Settlement Agreement as a placeholder initially because quantification required study. It is possible to quantify avoided environmental costs, specifically related to coal ash disposal, and therefore this component should now be quantified. It is not clear from DEP testimony that the Company has attempted to calculate or quantify this component at this time. It is unreasonable to assume that the current value is zero.

Q. Why is a zero value inappropriate for the Environmental Cost component?

A. There are many environmental costs that can be avoided through the decreased use of conventional combustion technologies such as coal, oil, and natural gas. Some, like criteria pollutant costs, have been reported as a separate component by DEP. Other costs, such as the capital costs related to management and disposal of waste and wastewater produced by coal-generators, are substantial but their avoidance have not yet been included.

Q. What other costs do you believe should be included in DEP's calculation of avoided Environmental Costs at this time?

A. I believe that the cost of coal ash disposal should be included as an avoided environmental cost. DEP's coal-fired power plants, as well as the coal-fired

power plants owned by Duke Energy Carolinas, LLC that are dispatched for the benefit of DEP customers,[8] generate large quantities of coal ash waste. This is regulated under the U.S. EPA's recently revised Coal Combustion Residuals (CCR) rule, as well as by the North Carolina Coal Ash Bill.[9] There are three broad categories of costs associated with coal ash waste:

1) Variable operational costs associated with coal ash disposal for each kWh of coal-fired generation.

2) Capital costs associated with building new impoundments. As coal ash impoundments fill up, new ones may be constructed.

3) Costs associated with the risk that an impoundment will leak and that leak will require clean up.[10]

Therefore, to the extent that NEM distributed energy resources reduce the dispatch of coal units, those NEM resources are allowing the Company to avoid the environmental costs associate with coal ash waste.

Q. How would you value the avoided Environmental Costs associated with coal ash waste?

A. NEM distributed energy resources allow for the utility to burn less coal, and therefore for the coal ash impoundments to fill less quickly. This has an economic value that is attributable to NEM resources and should be quantified and included in the DEP's calculations. We requested data in discovery to quantify the $/kWh cost based on the capacity of existing coal ash impoundments, the cost to build a new impoundment, and the quantity of coal ash generated at each coal-fired electric generating plant. However, we have not been provided with this data by DEP, and therefore I was unable to perform this calculation. The Company's

[8] SC PSC Docket Nos. 2011-158-E and 2011-68-E Settlement Agreement. Available at http://www.regulatorystaff.sc.gov/Documents/News%20Archives/DukeProgressSettlement.pdf.

[9] 2014 N.C. Sess, Laws 122; 2014 N.C. Ch. 122; 2013 N.C. SB 729.

[10] These risks and costs were laid out in the "Regulatory Impact Analysis: EPA's 2018 RCRA Proposed Rule Disposal of Coal Combustion Residuals from Electric Utilities; Amendments to the National Minimum Criteria (Phase One). March, 2018."

failure to disclose this information prevents me from doing the calculation, but the Company would still be able to perform this calculation and provide the $/kWh value to the Commission.

Line Losses

Q. How has DEP presented the value associated with the 2018 line loss calculations?

A. DEP presented the avoided line loss value as $0.000686/kWh for Small PV, and $0.000684/kWh for Large PV (Table 5, page 8 of Witness Brown's Testimony).

Q. Do you have any recommendations regarding DEP's line loss calculations?

A. Yes. In response to CCL and SACE discovery request 1-3, DEP provided a line loss study that relied on data from 2010. This study was done before the Duke Energy-Progress Energy merger, and therefore before the two companies began jointly dispatching to meet combined load.

DEP should conduct a new or updated line loss study for marginal line losses on the joint DEP-DEC Carolinas system in order to quantify avoided energy, generating capacity, and transmission capacity costs associated with line losses. The study should be specific to the Company's expected future hourly load forecasts and expected generator and transmission infrastructure. The study should use a solar PV profile rather than a fixed constant output profile, since most NEM resources in the near future are expected to be PV resources in DEP territory. Marginal line losses should be used because line losses increase with the square of the current, and marginal losses capture the actual impact of adding another kW of solar to the distribution system.

5. CONCLUSION

Q. Please summarize your recommendations regarding the net energy metering methodology—2018 application.

A. My recommendations are:

4. The Commission should require DEP to immediately adopt an avoided T&D value of $0.005778/kWh based on the Current Values approach described above.

5. DEP should conduct a study to more specifically quantify the avoided environmental cost of coal ash disposal as it relates to distributed PV to inform future NEM valuation updates in the fuel cost proceedings.

6. DEP should perform an updated line losses study to quantify marginal line losses associated with avoided energy, generating capacity and transmission capacity costs across DEP's current footprint. This study should be based on the Company's forecasted load and generation, and it should use a solar PV profile (not a fixed constant output profile).

Q. Does this conclude your testimony?

A. Yes.